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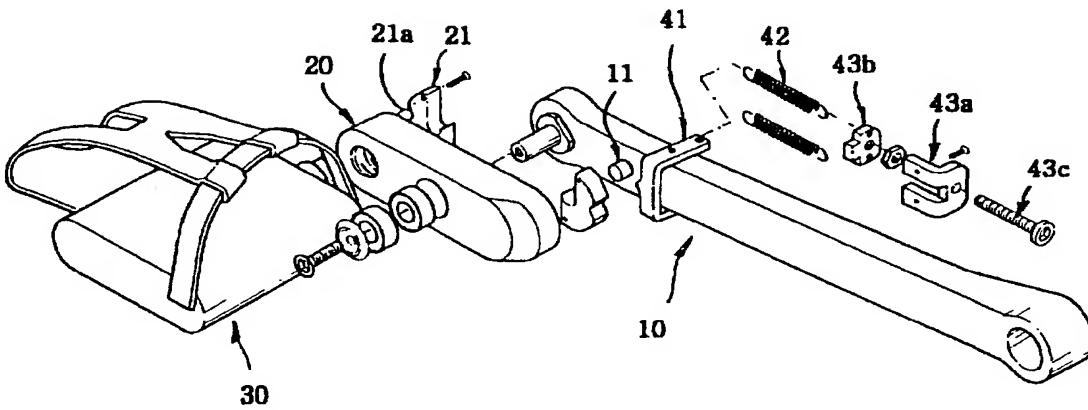
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(54) Title: DISTRIBUTED INTERNET BROADCASTING METHOD AND SYSTEM USING CAMERA AND SCREEN CAPTURE



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(57) **Abstract:** A distributed webcasting system and method for allowing anyone to easily produce a program and broadcast it over Internet in real time are provided. For existing webcast, expensive broadcasting equipment is necessary, and software for webcasting should be installed in a broadcasting computer. However, the present invention does not require installation of special software. According to the present invention, video, audio or text data can be captured and broadcasted by executing a producer client performed in a web environment using a technique such as ActiveX. Not only video data generated through a web camera can be broadcasted but also moving picture data and still picture data stored in a computer can be captured and broadcasted. In addition, as well as audio data generated through a microphone, audio data reproduced by an audio reproduction application can be broadcasted. In other words, the voice of a producer client can be directly broadcasted, or a music file executed at the producer client's computer can be broadcasted. A producer client can broadcast through a network with small upstream since the producer client and a web server can be independently located.

DISTRIBUTED INTERNET BROADCASTING METHOD AND SYSTEM USING CAMERA AND SCREEN CAPTURE

Technical Field

5 The present invention relates to a distributed webcasting system and method, and more particularly, to a distributed webcasting system and method for generating data using a web camera installed at a computer or generating data by executing a motion picture file stored in a computer using a motion picture reproducing application, thereby allowing anyone to easily 10 produce a private broadcast and to broadcast it over Internet in real time using a camera and image capture.

Background Art

Broadcasting had been developed into two fields, i.e., over-the-air 15 broadcasting and cable casting, up to several years ago. However, recently, a new notion of broadcasting has appeared due to development of Internet. In other words, the time anyone can broadcast at the lower cost and with less broadcasting equipment than before through the Internet has come. More practically speaking, anyone can broadcast his/her unique contents to 20 everybody throughout the world.

Generally, webcasting denotes broadcasting of a new notion of transmitting multimedia information such as audio, video, character and image to Internet users (including existing television viewers) using the Internet as a medium, instead of transmitting information (usually audio and 25 video information and, recently, character information) to viewers using TV and radio as media in over-the-air broadcasting or in cable casting.

Beginning with a view considering the Internet as a medium and culture, development of webcasting has been accelerated due to the high speed and a large amount of capacity of a user network environment 30 resulting from popularization of a high-speed network (for example, cable

network, Asymmetric Digital Subscriber Line (ADSL), and Integrated Services Digital Network (ISDN)) and due to appearance of software (for example, Streaming solutions-real systems, Windows media and Stream works) allowing transmission of audio, video and the like. In addition, since 5 multimedia data including audio, video and animation can be transmitted in a World Wide Web (WWW making multimedia Internet services possible) service which mostly provided texts and still images at the early stage, appearance of multimedia web sites, including webcasting stations, is accelerated. The file size of multimedia information including audio and 10 video is several tens or hundreds of times larger than that of other information. Accordingly, streaming technique has been developed to overcome a problem that it takes much time to transmit multimedia information. According to the streaming technique, Internet users can view 15 a desired file even if only a predetermined amount of the file is transmitted, and the remaining amount of the file is continuously transmitted while the users is viewing the previously transmitted amount of the file, instead that the users is allowed to view the file after completion of the transmission of the whole file. The streaming technique allows Internet users to view multimedia information including audio and video in real time.

20 Existing broadcasting media such as TV and radio one-sidedly transmit information to viewers except for giving the right of choice of a channel. Unlike, webcasting allows viewers to view desired programs at any time and at any place only if they can access the Internet. This conception is realized as Video On Demand (VOD). The VOD is a 25 communication service allowing a user to view a desired program at home by selecting the program through a TV or PC connected to a VOD server. The VOD is characterized by that many users can simultaneously share the same program at different times and places depending on the conditions of networks. For example, in the case of the weekend drama of the MBC 30 broadcasting, viewers have no other way of recording the drama with VTR to

view the drama at time other than the time it is broadcasted in TV. However, in webcasting, viewers can view a desired file at any time if they can access the Internet. Although the picture quality of webcasting is lower than that of TV broadcasting because the bandwidth of the webcasting is narrower than 5 that of the TV broadcasting, this limit will be able to be overcome by the propagation of a high-speed Internet network henceforward.

It can be said that such webcasting is easier than before for broadcast producers, but the webcasting is still difficult for general Internet users to approach. In other words, users should be furnished with a high-speed 10 Internet, private line and should buy expensive equipment. In addition, since existing webcasting depends on some large stations, diversification in providing information is not accomplished so that general Internet users cannot be provided with desired programs at desired places. Since webcasting users are provided only programs recorded and edited at studios 15 in webcasting stations, the users are provided with very restricted multimedia information only. Moreover, in the case of existing webcasting, only information input through a web camera installed at a computer can be broadcasted. In other words, a broadcast producer who accesses the Internet through a computer cannot directly broadcast pictures reproduced 20 through application programs in the computer, without using a web camera.

Disclosure of the Invention

The present invention proposed to solve the above problems relates to a distributed webcasting system and method including a producer client, a 25 broadcasting server and a viewer client. The producer client is always geographically separated from the viewer client. In addition, the present invention relates to a server configuration and a client configuration for real-time broadcasting.

Accordingly, it is a first object of the present invention to provide a 30 distributed webcasting system and method for allowing anyone who wishes

to broadcast to produce a broadcast and broadcasting it to general Internet users in real time.

It is a second object of the present invention to provide a distributed webcasting system and method for broadcasting video or audio data output 5 through a monitor or a speaker as well as data input through a web camera, by way of image capture using a video or audio file execution application.

It is a third object of the present invention to provide a distributed webcasting system and method capable of webcasting with a web camera and headset equipment only by making expensive compressing and editing 10 equipments into software.

It is a fourth object of the present invention to provide a distributed webcasting system and method for allowing viewer clients, as well as a viewer client and a producer client, to communicate with each other through a chatting server.

15 In one embodiment, there is provided a webcasting method for broadcasting multimedia information such as audio, video, character and image produced by a producer client to a viewer client through a high-speed communication network. The method includes the steps of requesting opening of a broadcasting channel, capturing data to be broadcasted when 20 the broadcasting channel is opened, encoding the captured broadcasting data, and transmitting the encoded broadcasting data to a broadcasting server; and searching all channels to assign an empty channel to the producer client in response to the request of the producer client for opening 25 of a broadcasting channel, linking the viewer client to the channel in response to the viewer client's request for participation in the channel, receiving the broadcasting data, and transmitting the broadcasting data to the viewer client through the channel in the form of streams.

30 In another embodiment, there is provided a webcasting system for broadcasting multimedia information such as audio, video, character and image produced by a producer client to a viewer client through a high-speed

communication network. The system includes a producer client for requesting opening of a broadcasting channel by making an application for a broadcasting channel, capturing data to be broadcasted when the broadcasting channel is opened, encoding the captured broadcasting data, 5 and transmitting the encoded broadcasting data; a broadcasting server connected to the producer client through the high-speed communication network, the broadcasting server searching all channels to assign an empty channel to the producer client in response to the request of the producer client for opening of a broadcasting channel, managing the channel, 10 updating and storing new channel information, receiving the broadcasting data transmitted from the producer client, dividing the broadcasting data into a plurality of streams, and transmitting the streams through the assigned channel; and a viewer client connected to the broadcasting server through the high-speed communication network, the viewer client sending a request 15 for participation in broadcasting to the broadcasting server, decoding the broadcasting data received from the broadcasting server to recover original data, and reproducing the original data to view it.

The present invention has many advantages. From different 20 embodiments or implementations, at least one of the following advantages can be derived. First, anyone can easily produce a program and broadcast it over the Internet in real time. For existing webcast, expensive broadcasting equipment is necessary, and software for webcasting should be installed in a broadcasting computer. However, the present invention does not require installation of special software. According to the present 25 invention, video, audio or text data can be captured and broadcasted by executing a producer client performed in a web environment using a technique such as ActiveX. Second, not only video data generated through a web camera can be broadcasted but also moving picture data and still picture data stored in a computer can be captured and broadcasted. In addition, as well as audio data generated through a microphone, audio data 30

reproduced by an audio reproduction application can be broadcasted. In other words, the voice of a producer client can be directly broadcasted, or a music file executed at the producer client's computer can be broadcasted. Third, a producer client can broadcast through a network with small 5 upstream since the producer client and a web server can be independently located.

The advantages and other aspect of the present invention will become apparent by describing in detail preferred embodiments thereof with reference to the attached drawings.

10

Brief Description of the Drawings

The present invention will be easily understood by describing preferred embodiments with reference to the attached drawings in which like reference numerals denote the same members:

15 FIG. 1 is a diagram of the entire configuration of a distributed webcasting system according to the present invention;

FIG. 2 is a detailed diagram of the configuration of a producer client producing and broadcasting contents according to the present invention;

20 FIG. 3 is a flowchart of a procedure in which a producer client produces a webcast according to the present invention;

FIG. 3A is a diagram of an example of the picture of a webcast production site;

FIG. 3B is a diagram of an example of an application for a broadcasting channel;

25 FIG. 3C is a diagram for explaining the functions of an exemplary broadcasting window;

FIG. 3D is a diagram of an example of image capture;

FIG. 4 is a diagram of the internal configuration of a broadcasting server according to the present invention;

30 FIGS. 5A and 5B are flowcharts of information in a process of

monitoring a broadcasting state;

FIG. 5C is a flowchart of information in a process of opening a channel and participating in broadcasting;

FIGS. 5D and 5E are flowcharts of information in a process of managing a channel when terminating broadcasting;

FIG. 6 is a detailed diagram of a viewer client according to the present invention;

FIG. 7 is a flowchart of processing for channel management and broadcasting resource management; and

FIG. 8 is a flowchart of processing for group management.

Best mode for carrying out the Invention

A detailed description below is provided for clear and complete understanding of the present invention. Hereinafter, preferred embodiments of a distributed webcasting system and method using a camera and image capture according to the present invention will be described in detail with reference to the attached drawings.

Referring to FIG. 1, a distributed webcasting system 1000 includes a producer client 200, a broadcasting server 400, and a viewer client 600. Individual members are connected to one another through Internet 800.

The producer client 200 is a person who produces a webcast personally. It is preferable that the producer client 200 easily and exactly edits information to be broadcasted using all sort of multimedia such as video, audio, image, graphic and text that can be implemented. For video data, a web camera is usually used, but Closed Circuit TeleVision (CCTV), Betacam, digital video camera, and camcoder can be used. Besides, if an audio switcher and an entire lighting set are prepared, data of a good quality can be broadcasted. Photographed information can be stored in an analog form, that is, in a tape. A VHS tape, 8 mm tape, and beta tape can be used. The broadcasting server 400 assigns a broadcasting channel in response to

the request of the producer client 200, receives broadcasting data transmitted from the producer client 200, divides the broadcasting data into a plurality of streams, and transmits the streams to the viewer client 600 through the assigned broadcasting channel. For example, when the 5 amount of data transmitted from the producer client 200 to the broadcasting server 400 is 100 kbps, and the number of viewer clients 600 is 100, the amount of data streams transmitted to the viewer clients 600 is $100 \text{ kbps} * 100 \text{ kbps} = 10 \text{ Mbps}$.

Generally, the Internet 800 can be realized as T1, T2, T3, asymmetric 10 digital subscriber line (ADSL), cable network, public switched telephone network (PSTN), or integrated services digital network (ISDN). Preferably, the broadcasting server 400 is located near a switch providing ADSL or connected to T1, T2 or T3. The clients 200 and 600 are not under special 15 restrictions, but it is preferable to use an ADSL or cable network practically providing high-speed Internet for users. Since the producer client 200 does not need to be within an expensive high-speed environment such as T1, T2 or T3, general users can produce a webcast. In other words, since the producer client 200 and the broadcasting server 400 can be independently constructed at different locations, the producer client 200 can realize 20 webcasting through a network with small upstream.

FIG. 2 is a detailed diagram of the configuration of the producer client 200 producing and broadcasting contents according to the present invention.

The producer client 200 includes a data generation unit 210, a data capture unit 220, an encoding unit 230, a camera 240, a microphone 250, and a 25 transmitting unit 260. The data generation unit 210 includes a moving picture player 212, a window picture 214, an application program 216, and an audio player 218. The data capture unit 220 includes a moving picture data capture device 222, a still picture data capture device 224, and an audio data capture device 226. The encoding unit 230 includes a video data 30 encoder 232 and an audio data encoder 234.

The data generation unit 210 generates data to be broadcasted. Broadcasting data is divided into video stream data and audio stream data. The video stream data is subdivided into moving picture data and still picture data. The moving picture data covers data generated through a typical web 5 camera and data generated through the moving picture player 212 (e.g., Windows Media Player or Real Player). The still picture data covers the window picture 214 and picture data which is displayed on a monitor through execution of the application program 216 (e.g., Microsoft Excel or Power Point) of the producer client 200. The audio stream data is subdivided into 10 audio data reproduced by the general audio player 218 and audio data generated through the microphone 250. It is apparent to one of ordinary skill in the art that the audio stream data can also include audio data reproduced by the moving picture player 212.

The data capture unit 220 captures the video stream data and audio 15 stream data generated by the data generation unit 210. Video data reproduced by the moving picture player 212 is captured by the moving picture data capture device 222. The window picture 214 and video data displayed through the application program 216 are captured by the still picture data capture device 224. Audio data reproduced by the moving 20 picture player 212 or the audio player 218 is captured by the audio data capture device 226. If only an audio service is provided in webcasting, it is enough to prepare only a sound card. In order provide a video service together, if a web camera is used, additional hardware is not necessary. However, if CCTV, camcoder or VTR is used, an additional video capture 25 board may be necessary. The format of a file generated by the data capture unit 220 has a .mov, .avi, .wav, or .au extension. Generally, for an audio file, a format having the .wav extension is widely used. For a video file, a format having the .avi or .mov extension is widely used. For software used in the data capture unit 220, the Premiere of the Adobe of the U.S., 30 which has a function of variously editing video as well as a simple function of

capturing video, and the Cool Edit having an excellent function as a sound editor may be used.

The encoding unit 230 compresses the captured video and audio data to facilitating transmission of the data. The video data encoder 232 encodes the data captured by the moving picture data capture device 222 and the data captured by the still picture data capture device 224. The audio data encoder 234 encodes the data captured by the audio data capture device 226. A compression technique is essential to efficient transmission of a large amount of data captured. Generally, a single TV channel, including an audio signal, occupies a band of 6 MHz. When this is digitized, it becomes information of 45 Mbps. It is nearly impossible to transmit such a large amount of information through an existing telephone line. Accordingly, a compression technique such as the MPEG method is used to compress information data. By using such a compression technique, information of 45 Mbps can be compressed into 1.5 Mbps. The MPEG method includes the MPEG-1 usually applied to a storing medium such as a CD-ROM, the MPEG-2 in which a compression rate varies with the configuration of pixels or image, the MPEG-4 that increases a data compression rate to allow data to be transmitted through a telephone line or an Internet network and supports a variable transmission rate for smooth data transmission regardless of a type of network, the MPEG⁺⁺ for compressing audio and video data of high definition TV (HDTV), and the H.263 or H.26L optimized for a bandwidth no greater than 200 kbps. Since data is communicated through the Internet in the present invention, it is preferable to use the MPEG-4, H.263 or H.26L.

In addition, the video data encoder 232 of the encoding unit 230 is connected to the camera 240, and the audio data encoder 234 thereof is connected to the microphone 250. Accordingly, video data transmitted through the camera 240 and audio data transmitted through the microphone 250 are also encoded so that the current appearance and voice of the

producer client 200 as well as video and audio data stored in the computer of the producer client 200 can be broadcasted in real time. The data compressed by the encoding unit 230 is transmitted to the broadcasting server 200 through the transmitting unit 260.

5 FIG. 3 is a flowchart of a procedure in which a producer client produces a webcast according to the present invention. FIG. 3A is a diagram of an example of the picture of a webcast production site. FIG. 3B is a diagram of an example of an application for a broadcasting channel. FIG. 3C is a diagram for explaining the functions of an exemplary broadcasting window. FIG. 3D is a diagram of an example of image capture.

10 To perform webcasting, a producer client should prepare basic equipment necessary for broadcasting. For example, a Pentium II 200 MHz computer or superior one, USB video camera, high-speed communication network such as ADSL or cable, and various broadcasting materials such as 15 CD, MP3, music video, conference materials, charts and photographs should be prepared. Here, a window picture or a moving picture can be captured and broadcasted even if a video camera is not prepared.

20 After completing basic preparation for webcasting, in step S310, the producer client inputs the URL address (e.g., <http://mystation.lycos.co.kr>) of a site, which opens a broadcasting channel for a user, and applies for a broadcasting channel to commence webcasting. To apply for a broadcasting channel, an application should be appropriately made according to its form. For example, if the producer client clicks "Producing 25 my own broadcasting" (i.e., contents located at an upper left portion) on the initial screen of a webcasting production site shown in FIG. 3A, an application for a broadcasting channel is displayed, as shown in FIG. 3B. The producer client fills the items on the application. When an "open/not open to the public" item is set to a "not open" and when a password is set, only users knowing the password are admitted to the producer client's broadcast. In a "limit in the number of viewers" item, a maximum for the 30

viewers of a channel to be opened is set. A broadcasting window size can be set to be large or small. The small size is 176 * 144, and the large size is 352 * 288. The large size is not suitable for swift motion. Accordingly, it is preferable to set a window size appropriate to the type of broadcasting
5 materials.

After completing the application for a broadcasting channel, in step S320, the producer client requests to open a broadcasting channel by clicking an "open" button. If the producer client's request for opening of a broadcasting channel is received, in step S330, a broadcasting server
10 determines whether the producer client requests a broadcasting channel for the first time. If the request is the first one, in step S340, a client program for broadcasting (e.g., ActiveX) which is software necessary for producing a webcast according to the present invention is automatically installed.

When installation of the broadcasting client is completed, in step S350,
15 an initial screen is displayed, as shown in FIG. 3C. At the upper portion of the initial screen, a "broadcasting screen" on which video data generated by the producer client is displayed is located. Below the broadcasting screen, a "chatting window" on which the producer client and a viewer client can communicate character data to each other is located. Below the chatting
20 window, various functional buttons are located. The functional buttons are a "Select Microphone" button for broadcasting the producer client's voice, a "Select PC Audio" button for broadcasting sound output from the producer client's computer such as Winamp, Media player or CD player, a "Start/End Image Capture" button for capturing an image to be broadcasted, a "End Broadcast" button for ending the broadcast, and a "Control Color of Chatting Letters" button for setting the color of the letters shown on the chatting window. In addition, a function of displaying the transmission rate of video
25 broadcasted currently and a function of displaying the number of current viewers are included. When a web camera is used, images taken by the
30 web camera are displayed on the broadcasting screen. When a web

camera is not used, an empty space is displayed on the broadcasting screen.

When the right button of a mouse is clicked on a broadcasting window and then turning off video is selected, video is not displayed, but audio only is broadcasted.

5 In step S360, an image taken by a web camera is broadcasted when the producer client uses the web camera, but the producer client clicks the "Start/End Image Capture" button on the broadcasting window to capture a desired image when not using a web camera or when intending to broadcast other broadcasting materials. When the "Start/End Image Capture" button
10 is clicked once, an image is converted into a PC screen. The producer client moves a capture window to a portion to be broadcasted and start a capture broadcast. For example, as shown in FIG. 3D, when intending to capture a music video or a moving picture with a Windows Media Player, the producer client has only to move the capture window to a picture he/she
15 wishes to broadcast. Similarly, a still picture can also be captured by bringing a still picture to the PC screen and moving the capture window to a portion to be broadcasted on the still picture. This capture function is brought about by a broadcasting client (e.g., ActiveX). The size of the capture window can be selected from a large one and a small one. When
20 intending to broadcast album record jackets or still pictures while mainly broadcasting music instead of a moving picture, a transmission rate over a network can be efficiently used by periodically performing turning off and on video on the broadcasting window after capturing the desired portion of a picture. When only music is broadcasted, a necessary transmission rate is
25 about 24 kbps. When both video and audio are broadcasted, a necessary transmission rate is about 100 kbps.

When video or audio data to be broadcasted is completely captured, in step 370, an encoding unit (230 of FIG. 2) encodes the captured broadcasting data and transmits it to the broadcasting server (200 of FIG. 1) 30 through a transmitting unit (260 of FIG. 2).

FIG. 4 is a diagram of the internal configuration of the broadcasting server 400 according to the present invention. The broadcasting server 400 includes a web server 410, a connection controller 420, a database (D/B) 430, a unit 440 and a gateway 450. The unit 440 includes a distribution 5 main server processor 442 and distribution sub-server processors 444 and 446.

The web server 410 is connected to producer clients through the Internet, and its server name is registered in a domain name server. The web server 410 is server hardware through which general Internet users can 10 search for information in the form of Uniform Resource Locator (URL). In order to smoothly manage a webcast production site according to the present invention, a web server program should be installed and executed. The web server 410 includes a server program, which is executed to process a information search request having a URL form transmitted from a producer 15 client or a viewer client, and a processing program which supports server-client interaction to process an Internet user's request (e.g., an application for membership, request to open a broadcasting channel or request to participate in a broadcasting channel). For the server program, NCSA, CERN, Apache and JIGSAW which are servers for the Unix, IIS 20 which is a server for the Windows NT, and WebSite which is a server for the Windows NT, Windows 95 and Windows 98 can be used. For the processing program, Common Gateway Interface (CGI), which is a standardized mutual information communication method, is usually used. Information is transmitted to the web server 410 according to a CGI format. 25 An Internet user's request for information is appropriately translated according to the CGI format by a CGI program installed in the web server 410. Therefore, the information transmitted to the web server 410 can be processed in response to the user's request. In addition, the web server 410 provides a broadcasting client program for producing a webcast to a 30 producer client when the producer client requests to open a broadcasting

channel for the first time.

The connection controller 420 is connected to the web server 410. The main function of the connection controller 420 is to connect a viewer client to a producer client through the unit 440. The connection controller 5 420 searches the unit 440 for an empty channel in response to a producer client's request for opening of a channel and assigns the searched channel to the producer client. Besides, the connection controller 420 performs functions such as general management of broadcasting channels, monitoring of the unit 440, load balancing, log processing, remote management 10 processing, and backup of channel information.

The D/B 430 is connected to the connection controller 420 and stores various kinds of information on channels and groups (e.g., channel space information, information on the number of participants, and information on the interrelation between groups). The information on channels and groups 15 is stored in the form of a transforming table. The D/B 430 extracts proper information in response to the request of the connection controller 420 and transmits it to the connection controller 420.

The unit 440 is connected to the connection controller 420. The unit 440 receives stream data that a producer client wishes to broadcast and 20 assigns it to a channel. The unit 440 is composed of a plurality of groups (e.g., 50 groups), and each group can accommodate 10 users. Accordingly, 500 users can participate in a single unit 440. The number of groups constituting the unit 440 varies with the capacity of a server. In this specification, the number of groups is set to 50. It is preferable to set the 25 number of users accommodated by each group to 10 as a maximum. Each of the groups in the unit 440 can functions as the distribution main server processor 442 or the distribution sub-server processor 444 or 446. The function of each group is determined by the connection controller 420 when the groups practically participate in broadcasting. The distribution main 30 server processor 442 transmits a broadcasting material produced by a

producer client to a viewer client participating in a relevant group. When linking a broadcasting material for a first group to another second group, the distribution sub-server processor 444 or 446 connects the first group to the second group and transmits the broadcasting material to a viewer client 5 participating in the second group. In other words, the distribution main server processor 442 includes both a producer client and a viewer client, and the distribution sub-server processor 444 or 446 includes only a viewer client.

When an excessive number of users want to participate in one group, the distribution sub-server processors 444 and 446 are necessary to broadcast 10 the broadcasting contents of the group to excess personnel of viewer clients.

The groups form a tree structure, and link information between the groups is managed by the connection controller 420. Each unit 440 periodically transmits its unit information (e.g., channel space information, information on the number of participants, and information on the interrelation between 15 groups) to the connection controller 420 so that a producer client or a viewer client can access an optimal unit 440.

The gateway 450 is connected to the distribution main server processor 442 and to the distribution sub-server processors 444 and 446. The gateway 450 connects each processor to a viewer client so that content 20 broadcasted by a producer client can be transmitted to a relevant viewer client.

FIGS. 5A through 5E are flowcharts of information between a producer client and a broadcasting server. Reference characters P and C denote a producer client and a viewer client, respectively. WEB denotes a 25 web server, CSM denotes a connection controller, UNIT denotes a unit, and D/B denotes a database.

FIGS. 5A and 5B are flowcharts of information in a process of monitoring a broadcasting state. Periodically or when an event such as a request for opening of a channel occurs, in step (1), the web server makes 30 an attempt at connection to the port No. 5000 of the CSM. When the

connection is successfully accomplished, the CSM extracts current broadcasting channel information from the D/B in step (2) and transmits it to the web server in step (3). Here, in step (4), a connection time limit for preventing frequent connection can be set according to the setup of the 5 broadcasting server in order to reduce a load on the D/B. The connection time limit can be set, for example, in terms of seconds.

FIG. 5C is a flowchart of information in a process of opening a channel and participating in broadcasting. When the producer client requests the web server to open a channel for broadcasting in step (1), the 10 web server transmits relevant information to the CSM in step (2). The CSM extracts channel information from the D/B in step (3), assigns a unit for a channel broadcasting service in step (4), and transmits assigned unit information and the Internet Protocol (IP) address of the unit to the web server in step (5). In other words, after opening the channel, the producer 15 client should sequentially access the web server, the CSM and the unit in order to participate in broadcasting. Next, the web server transmits assigned channel information and the IP address of the CSM to the producer client in step (6). The producer client transmits a channel number in which he/she will participate to the CSM in step (7). Thereafter, when the CSM 20 transmits the assigned unit information to the producer client in step (8), the producer client accesses the assigned unit and commences broadcasting in step (9).

FIGS. 5D and 5E are flowcharts of information in a process of managing a channel when terminating broadcasting. If the producer client 25 requests the unit to terminate broadcasting in step (1), the unit reports the request to the CSM in step (2). Next, the CSM transmits a channel closing command to the unit in step (3). If viewer clients all withdraw from the broadcasting channel in step (4), the CSM transmits channel information to the D/B in step (5) to inform that the channel is empty, and transmits 30 information on the channel to the web server in step (6).

A change in channel information can be known from a unit table and a D/B table. When a channel is opened, after the D/B table is set, the unit table is set. To the contrary, when a channel is closed, after the unit table is reset, the D/B table is reset. When a channel information update command 5 is generated the moment a channel is opened, opening of the channel is recorded in the unit table but may not be recorded in the D/B table. A normal case and an abnormal case having errors will be described below.

(1) Normal Case

- 1) A producer client requests to open a channel.
- 10 2) A CSM reads channel information from a D/B and determines a channel to be assigned (it is assumed that a channel No. 3 is assigned)
- 3) The channel No. 3 is set in a D/B table.
- 4) A command to open the channel No.3 is transmitted to a unit.
- 5) The channel No. 3 is set in a unit table.
- 15 6) A unit address and a channel number are transmitted to the producer client.

(2) Case where an Error Occurs (Case where a Web Server Updates CSM Information between the above steps 3) and 5))

- 20 1) A producer client requests to open a channel.
- 2) A CSM reads channel information from a D/B and determines a channel to be assigned (it is assumed that a channel No. 3 is assigned)
- 3) The channel No. 3 is set in a D/B table.
- 4) A web server requests information from a unit.
- 25 5) Unit table information is transmitted.
- 6) Since the channel No. 3 is empty according to a unit table, the channel No. 3 is reset in the D/B table.
- 7) A command to open the channel No.3 is transmitted to a unit.
- 8) The channel No. 3 is set in the unit table.

In other words, when an error occurs, the channel No. 3 is reset in the D/B table but is set in the unit table.

Such an error occurs because two or more different demons or scripts operate in a web server. This problem can be overcome by providing a 5 reset count for a D/B table. In other words, the D/B table is designed such that a channel is reset when a predetermined number has been counted or when a predetermined time has elapsed after the channel is set. For example, after setting a channel, a time when the command is carried out is recorded, and the channel is not reset if at least 30 seconds does not 10 elapsed. Such a function can be implemented in a web server or a D/B. In a web server, the function can be implemented by reading a time before resetting a D/B to obtain a time difference and determining whether to reset or not based on the time difference. In a D/B, the function can be implemented by refusing a reset command for a predetermined time since 15 generation of a latest setting command.

A problem in making a unique channel may occur when two or more web servers are managed. In other words, there may be a case where two web servers nearly simultaneously access a D/B, search for the same empty channel and command to open the same channel. Although the second 20 command is ignored by a CSM, such a problem can be overcome by reading a channel number from a D/B using a sequence command or record lock function and preventing another web server from accessing a channel table while a new channel is assigned.

FIG. 6 is a detailed diagram of the viewer client 600 according to the 25 present invention. The viewer client 600 includes a receiving unit 610, a decoding unit 620, a data reproduction unit 630, a monitor 640, and a speaker 650. The decoding unit 620 includes a video decoder 622 and an audio decoder 624. The data reproduction unit 630 includes a moving picture displayer 632, a still picture displayer 634, and an audio player 636.

30 The receiving unit 610 receives video and audio stream data

transmitted from the gateway 450 of the broadcasting server 400 and transfers the received video and audio stream data to the decoding unit 620.

The decoding unit 620 is connected to the receiving unit 610 and decodes the video and audio stream data received from the receiving unit 610.

- 5 Since the video and audio stream data transmitted from the gateway 450 of the broadcasting server 400 has been encoded, the video and audio stream data should be restored to original data. Here, the video stream data is decoded by the video decoder 622, and the audio stream data is decoded by the audio decoder 624. The data reproduction unit 630 is connected to the
- 10 decoding unit 620. The moving picture display 632 and the still picture display 634 are connected to the video decoder 622, and the audio player 636 is connected to the audio decoder 624. The data reproduction unit 630 divides the screen of the viewer client 600 into a plurality of sections, display a moving picture in one section and a still picture in another section, and
- 15 allows broadcasting participants to communicate through text chatting in still another section. Accordingly, viewers can view all types of broadcasting contents with only the viewer client 600, regardless of the type of data input by a producer. The video data reproduced by the moving picture display 632 and the still picture display 634 is displayed through the computer monitor 640 of the viewer client 600. The audio data reproduced by the
- 20 audio player 636 is output through the speaker 650.

FIG. 7 is a flowchart of processing for channel management and broadcasting resource management. Once a viewer client requests participation in a broadcasting channel, in step S710, a CSM keeps the viewer client waiting for connection before permitting access to the channel. In step S720, the CSM determines whether the channel requested by the viewer client is under broadcasting at present. If it is determined that the channel is under broadcasting, in step S730, the CSM determines whether allowance for participation in the channel is available. Relevant channel information can be searched for using the D/B 430 of FIG. 4. If it is

determined that the allowance is not available, in step S740, it is determined whether a group within a unit including the channel can be extended. If it is determined that the group can be extended, in step S750, the group is linked to another group, thereby extending a service of the channel. If it is 5 determined that the channel requested by the viewer client is not under broadcasting at present in the step S720, or if it is determined that the group cannot be extended in the step S740, the access to the channel requested by the viewer client is refused, and the process returns to the step S710, in step S760 to repeat the above process. If it is determined that the 10 allowance for participation in the channel is available in the step S730, or if the service of the channel is extended in the step S750, an available unit or group is assigned for the viewer client through load balancing in step S770, and the process turns to the step S710.

FIG. 8 is a flowchart of processing for group management. As the 15 number of channels increases, and as the number of participants in each channel increases, more resources (i.e., groups in each unit) for broadcasting are used. It is necessary to examine these resources using the resource release algorithm of a CSM at regular time intervals to determine whether they are in use or not and to release resources not in use 20 so that the resources not in use can be assigned to another channel. For this, in step S810, the CSM searches all groups in each unit. The CSM searches a list of the resources of a relevant channel in step S820, and determines whether a broadcasting participant (i.e., a producer client or a viewer client) exists in the last group of the channel in step S830. If it is 25 determined that no participant exists, in step S840, the previous group linked to the last group is searched to determine whether the number of participants currently accommodated by the previous group is smaller than the predetermined maximum number (e.g., 10) of participants. If it is determined that the number of participants of the previous group is smaller 30 than the predetermined maximum number of participants, in step S850, the

last group is removed from the channel resource list, and the process ends. If it is determined that a participant exists in the last group in the step S830, or if it is determined that there is no more allowance for a participant in the previous group in the step S840, the process ends without removing the last 5 group from the channel resource list. In other words, when the last group of the resources serving one channel is empty and the previous group has allowances so that a few more participants can be admitted for a predetermined period, it is preferable to remove the last group from the channel resource list in order to allow the last group to serve another group.

10

Industrial Applicability

When a distributed webcasting system and method according to the present invention are widely used in the Internet, anyone can provide a broadcasting program produced by himself/herself for numerous persons 15 through the Internet. A webcasting system according to the present invention can be applied to a lecturing system for education, a securities presentation broadcasting system, a private broadcasting system for an association of like-minded persons (e.g., a poetry-lovers association, a music-lovers association, or a film-lovers association), a webcasting station 20 in which broadcasting is accomplished by participation of many persons and so on. For example, present one-way on-line lecturing system can be developed into an interactive lecturing system between a lecturer and a learner. In the case of an on-line auction system, which mainly depends upon a text at present, an auctioneer can show an article in real time through 25 broadcasting, and the auctioneer and a bidder can interact with each other during the auction. In the case of on-line shopping, a seller can do marketing similar to cable TV shopping in real time on the Internet. In addition, according to the present invention, anyone can realize any type of broadcasting performed through over-the-air broadcasting and cable casting 30 at a low cost by constructing a broadcasting station on the Internet.

The above embodiments of the present invention should be construed in descriptive sense only and not for purposes of limitation. It will be apparent to one of ordinary skill in the art that modifications of the described embodiments may be made without departing from the spirit and scope of 5 the invention. For example, the appearances and structures of the members shown in the embodiments can be modified. The present invention can also be widely applied to other fields.

What is claimed is:

1. A webcasting method for broadcasting multimedia information such as audio, video, character and image produced by a producer client to a viewer client through a high-speed communication network, the method comprising the steps of:

5 a) requesting opening of a broadcasting channel, capturing data to be broadcasted when the broadcasting channel is opened, encoding the captured broadcasting data, and transmitting the encoded broadcasting data to a broadcasting server; and

10 b) searching all channels to assign an empty channel to the producer client in response to the request of the producer client for opening of a broadcasting channel, linking the viewer client to the channel in response to the viewer client's request for participation in the channel, receiving the broadcasting data, and transmitting the broadcasting data to the viewer client through the channel in the form of streams.

15

2. The webcasting method of claim 1, wherein the step a) comprises the steps of:

20 a1) filling in an application for a broadcasting channel to request opening of a broadcasting channel;

 a2) determining whether the request for opening of a broadcasting channel is the first;

 a3) automatically installing a broadcasting client program necessary for broadcasting when the request is the first; and

25 a4) capturing the broadcasting data, encoding the captured broadcasting data, and transmitting the encoded broadcasting data to the broadcasting server.

3. The webcasting method of claim 1, wherein the step b) comprises the steps of:

30

- b1) receiving channel information from a unit managing channels as a whole and storing the channel information
- b2) searching the stored channel information when the producer client's request for opening of a broadcasting channel is received
- 5 and then assigning an empty channel to the producer client;
- b3) checking the number of participants in a channel requested when the viewer client's request for participation in the channel is received, linking the viewer client to the requested channel when the number of current participants is smaller than the maximum number of participants, and extending the channel to link the viewer client to the extended channel when the number of current participants is the same as the maximum number of participants; and
- 10 b4) connecting the producer client to the viewer client through the assigned channel and broadcasting the broadcasting data produced by the producer client to the viewer client.
- 15

4. The webcasting method of claim 1, wherein the speed communication network is one selected among a private line including T1, T2 and T3, a cable communication network, an asymmetric digital subscriber line (ADSL), an integrated services digital network (ISDN) and a public switched telephone network (PSTN).

5. The webcasting method of claim 1, wherein the broadcasting data comprises video data, audio data and text data.

25

6. The webcasting method of claim 2, wherein the application for a broadcasting channel in the step a1) comprises items of applicant's name, title of broadcast, open/not open to the public, limit in the number of viewers, broadcasting window size, and description of broadcast.

30

7. The webcasting method of claim 2, wherein in the step a4), the broadcasting data is captured using the broadcasting client program, video data input through a camera or audio data input through a microphone is directly broadcasted, and moving picture data, still picture data or audio data stored in the producer client's computer is captured and broadcasted.

8. The webcasting method of claim 2, wherein in the step a4), the captured broadcasting data is encoded according to one method selected from MPEG, H.263 and H.26L.

9. The webcasting method of claim 3, wherein the step b) further comprises the step of b5) searching a list of the resources of the extended channel, checking the number of current participants in a last channel resource among a plurality of channel resources linked to one another, and removing the last channel resource from the channel resource list when there is no participant in the last channel resource and there is allowance for a few participants in the previous channel resource linked to the last channel resource.

20

10. The webcasting method of claim 3, wherein the unit is composed of groups, and the channel is composed of more than one group.

25

11. The webcasting method of claim 3, wherein the channel information stored in the step b1) is periodically received from the unit and updated.

12. A webcasting system for broadcasting multimedia information such as audio, video, character and image produced by a producer client to

a viewer client through a high-speed communication network, the system comprising:

5 a producer client for requesting opening of a broadcasting channel by making an application for a broadcasting channel, capturing data to be broadcasted when the broadcasting channel is opened, encoding the captured broadcasting data, and transmitting the encoded broadcasting data;

10 a broadcasting server connected to the producer client through the high-speed communication network, the broadcasting server searching all channels to assign an empty channel to the producer client in response to the request of the producer client for opening of a broadcasting channel, managing the channel, updating and storing new channel information, receiving the broadcasting data transmitted from the producer client, dividing the broadcasting data into a plurality of streams, and transmitting 15 the streams through the assigned channel; and

20 a viewer client connected to the broadcasting server through the high-speed communication network, the viewer client sending a request for participation in broadcasting to the broadcasting server, decoding the broadcasting data received from the broadcasting server to recover original data, and reproducing the original data to view it.

13. The webcasting system of claim 12, wherein the producer client comprises:

25 a data generation unit comprising a moving picture player for reproducing moving picture data, a window screen and an application program for reproducing a still picture, and an audio player for reproducing audio data, the data generation unit generating video stream data and audio stream data which will be broadcasted;

30 a data capture unit comprising a moving picture data capture device for capturing moving picture data, a still picture data capture device

for capturing still picture data, and an audio data capture device for capturing audio data, the data capture unit being connected to the data generation unit and capturing the video stream data and audio stream data generated from the data generation unit;

5 an encoding unit comprising a video data encoder for compressing video data and an audio data encoder for compressing audio data, the encoding unit being connected to the data capture unit and compressing the video and audio data captured by the data capture unit to easily transmit the data; and

10 a transmitting unit for transmitting the data compressed by the encoding unit to the broadcasting server, the transmitting unit being connected to the encoding unit.

14. The webcasting system of claim 12, wherein the
15 high-speed communication network is one selected among a private line including T1, T2 and T3, a cable communication network, an asymmetric digital subscriber line (ADSL), an integrated services digital network (ISDN) and a public switched telephone network (PSTN).

20 15. The webcasting system of claim 12, wherein the broadcasting data comprises video data, audio data and text data.

25 16. The webcasting system of claim 12, wherein the application for a broadcasting channel comprises items of applicant's name, title of broadcast, open/not open to the public, limit in the number of viewers, broadcasting window size, and description of broadcast.

30 17. The webcasting system of claim 13, further comprising:
 a camera for inputting data of a current image of the producer client;
 and

a microphone for capturing the voice of the producer client.

18. The webcasting system of claim 13, wherein the
encoding unit uses one compressing method selected from MPEG, H.263
5 and H.26L.

19. The webcasting system of claim 13, wherein the data
capture unit performs a capture operation using a broadcasting client
program provided from the broadcasting server, and captures and
10 broadcasts not only video data input through a camera or audio data input
through a microphone but also moving picture data, still picture data or
audio data stored in the producer client's computer.

20. The webcasting system of claim 17, wherein the
15 camera is one selected among web camera, Closed Circuit TeleVision
(CCTV), Betacam, digital video camera and camcoder.

21. The webcasting system of claim 12, wherein the
broadcasting server comprises:

20 a web server connected to the producer client and the viewer
client through the high-speed communication network, the web server
comprising a server program for processing an information search request
having a Uniform Resource Locator (URL) form transmitted from the
producer client or the viewer client and a processing program for supporting
25 server-client interaction to process an Internet user's request, the web
server providing a broadcasting client program necessary for producing a
webcast to the producer client when receiving the producer client's request
for opening of a broadcasting channel;

30 a connection controller connected to the web server, the
connection controller searching for and assigning an empty channel in a

unit in response to the producer client's request for opening of a channel, linking the viewer client to a channel in response to the viewer client's request for participation in the channel, and performing functions such as general management of broadcasting channels, unit monitoring, load 5 balancing, log processing, remote management processing, and backup of channel information;

a database connected to the connection controller, the database storing information on channels and groups;

10 a unit connected to the connection controller, the unit receiving the broadcasting data that the producer client wish to broadcast, assigning a channel for the data, collecting information on each channel, and transmitting the information to the connection controller; and

a gateway connected to the unit, the gateway transmitting the broadcasting data received through the unit to the viewer client.

15

22. The webcasting system of claim 21, wherein the unit is composed a plurality of groups and periodically transmits the channel information to the connection controller, and each group is a distribution main server processor including both the producer client and the viewer 20 client or a distribution sub-server processor including only the viewer client.

23. The webcasting system of claim 22, wherein the distribution sub-server processor transmits personnel information of each linked channel to the connection controller, and the connection controller 25 searches a list of the resources of an extended channel, checks the number of current participants in a last channel resource among a plurality of channel resources linked to one another, and removes the last channel resource from the channel resource list when there is no participant in the last channel resource and there is allowance for a few participants in the 30 previous channel resource linked to the last channel resource.

24. The webcasting system of claim 21 or 22, wherein the unit is composed of groups, and the channel is composed of more than one group.

5

25. The webcasting system of claim 21, wherein the information on channels and groups stored in the database comprises channel space information, information on the number of participants, and information on the interrelation between groups, and the information on channels and groups is stored in the form of a transforming table.

10

FIG. 1

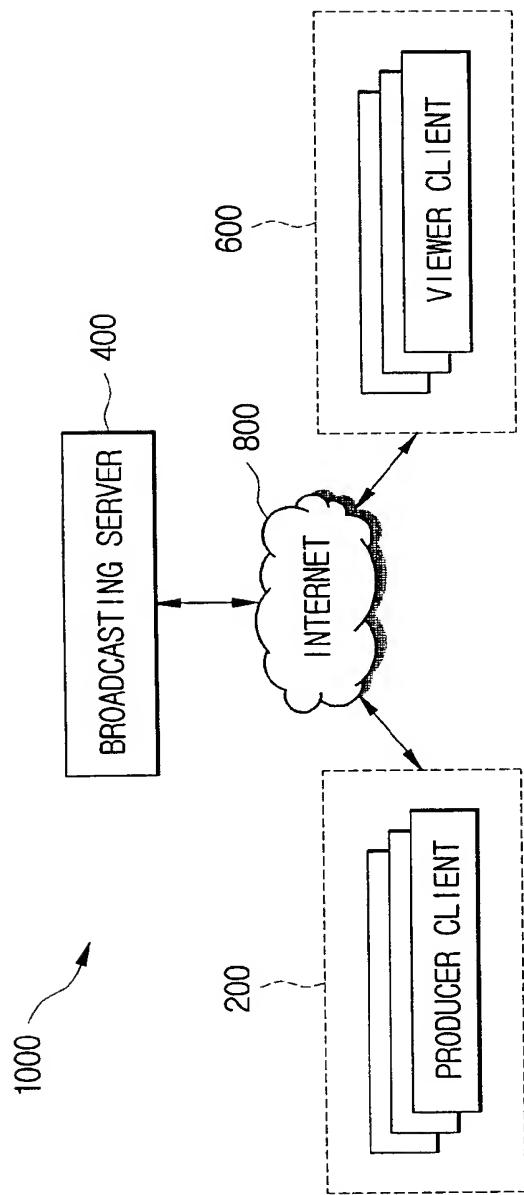


FIG. 2

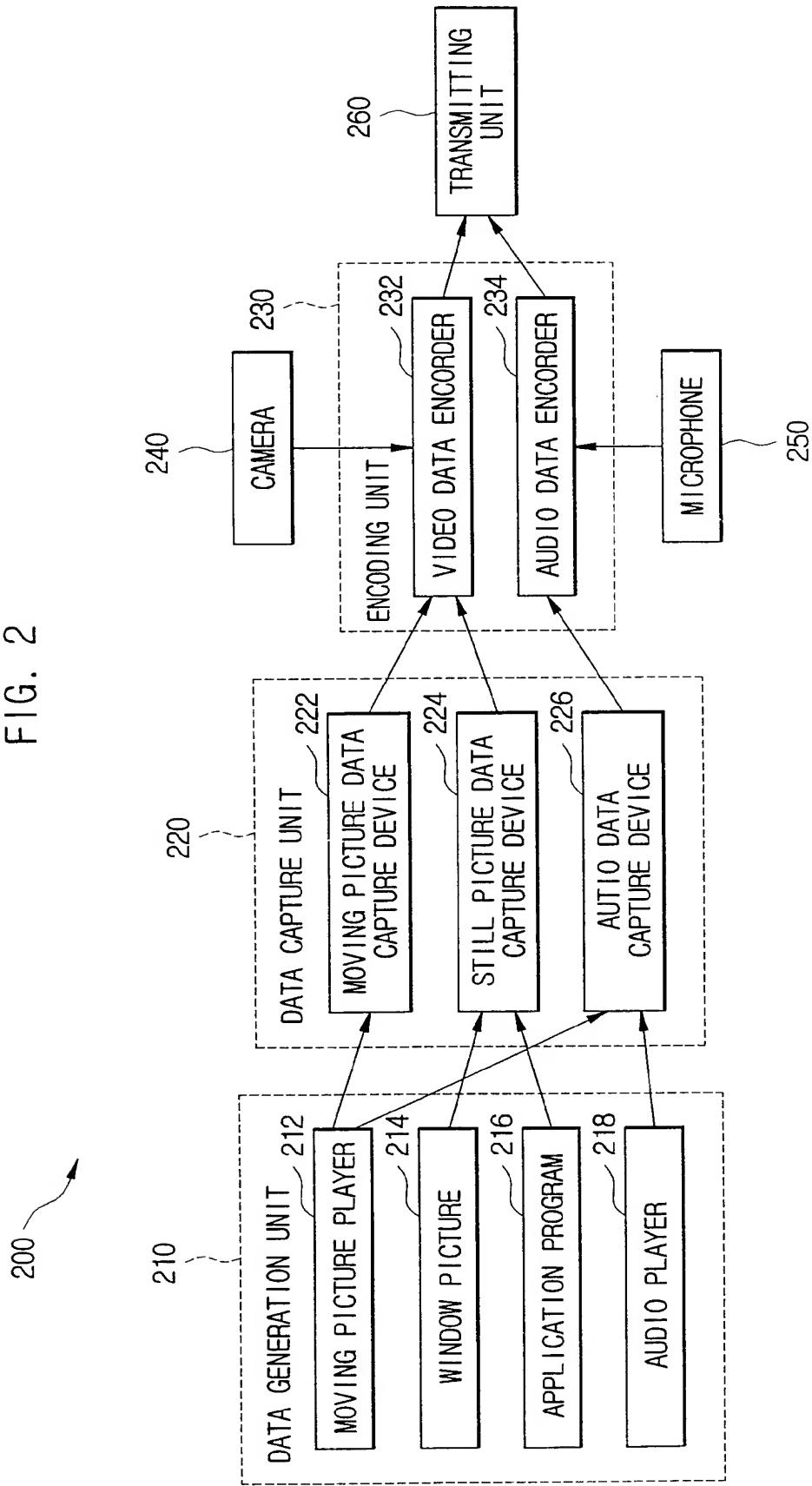


FIG. 3

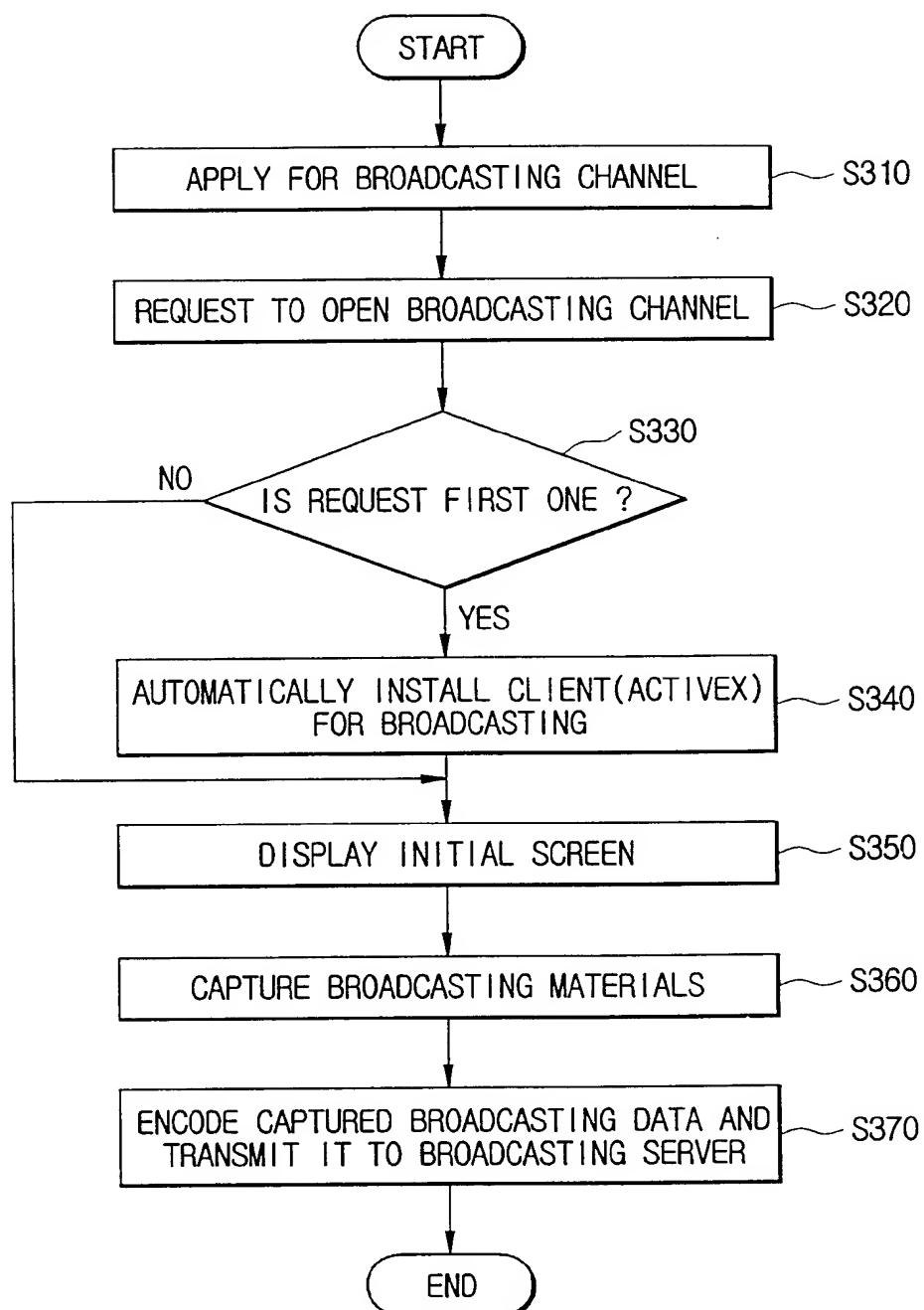


FIG. 3A

LYCOS PRIVATE BROADCAST

LYCOS HOME > PRIVATE BROADCAST

• PRODUCING MY OWN BROADCAST
 • VIEW BROADCAST LIST
 • USER GUIDE
 • FAQ
 • REFERENCE SITES
 • BULLETIN BOARD FOR RECOMMENDATION
 • INTRODUCTION OF BROADCASTS
 • WEB CAMERA/HEADSET
 • EVENT
 • HOME
 • WELCOME, MR. SEO IN-WON

SEARCH

CHANNEL NO.

1 ~ (NIGHTMARE) ~

2 /OH/HI
ON AIR

3 ★ COME TO HOOSEN BROADCAST TO ENJOY TRUTHFUL AND HONEST CONVERSATION WITH PERSON IN THE THIRTIES AND FORTIES AND LIVE MUSIC. HAVE A GOOD TIME~

4 ★ HOOON BROADCAST ★
(kimbr6060)

5 CHIEF=MALE (NOMDLEA)

6 YOONBEE . (zzibee)

7 ANGYEYO (balanchenlg)

8 DANMUZI (danimuzi40)

9 MUSIC LAND OF DANMUZI!
DENGKOO! CAME OUT

10 FOREIGN SINGER BROADCAST (TODAY'S PRIME TIME: GF OSE-IT'S GONNA BE ME AND VARIETY)

11 JAENGSUE (jungsuepark)

• MOVIES
 • MOVIE THEATER
 • MUSIC
 • BROADCAST GUIDE
 • BUNGEE JUMP
 • KILLING TIME

CHIEF OF BROADCASTING STATION NUMBER OF VIEWS PARTICIPATION

~(nighthmar666)~ 4/10 OPEN

gkdl (jim5012) 2/10 OPEN

素方不凡(bigshaw) 2/10 OPEN

★ HOOON BROADCAST ★ 26/30 OPEN

CHIEF=MALE (NOMDLEA) 8/20 OPEN

YOONBEE . (zzibee) 5/10 OPEN

ANGYEYO (balanchenlg) 6/20 NOT OPEN

DANMUZI (danimuzi40) 3/10 NOT OPEN

DENGKOO!-(aaaassss) 5/20 OPEN

JAENGSUE (jungsuepark) 1/20 OPEN

• BACK | >NEXT | #CALLING A CONFERENCE

FIG. 3B

 LYCOS PRIVATE BROADCAST	
LYCOS HOME > PRIVATE BROADCAST	
<p>PRODUCING MY OWN BROADCAST</p> <p><input checked="" type="checkbox"/> PRODUCING MY OWN BROADCAST</p> <p><input type="checkbox"/> VIEW BROADCAST LIST</p> <p><input type="checkbox"/> USER GUIDE</p> <p><input type="checkbox"/> FAQ</p> <p><input type="checkbox"/> REFERENCE SITES</p> <p><input type="checkbox"/> BULLETIN BOARD FOR RECOMMENDATION</p> <p><input type="checkbox"/> INTRODUCTION OF BROADCASTS</p> <p><input type="checkbox"/> WEB CAMERA/HEADSET</p> <p><input type="checkbox"/> EVENT</p> <p><input type="checkbox"/> HOME</p>	
<p>IT APPEAR AT 230*30 ON A SCREEN WHEN AN IMAGE IS USED</p>	
<p>TITLE OF BROADCAST</p> <p><input type="text"/> OPEN <input checked="" type="checkbox"/> NOT OPEN</p> <p>PASSWORD FOR NOT OPEN</p>	
<p>LIMIT IN THE NUMBER OF VIDEOS <input type="text" value="10"/> <input type="button" value="▼"/></p>	
<p>BROADCASTING WINDOW SIZE</p> <p><input checked="" type="checkbox"/> SMALL <input type="checkbox"/> LARGE</p>	
<p>DESCRIPTION OF BROADCAST</p> <p><input type="text"/></p>	
<p><input type="checkbox"/> BROADCAST</p> <p><input type="checkbox"/> SCREEN</p>	
<p>NOTICE 1) IF YOU WANT TO SHOW A BROADCAST, YOU NEED A WEB CAMERA.</p> <p>NOTICE 2) MODEM USER AND NETSCAPE USERS CANNOT USE THIS SERVICE.</p>	
<p><input type="checkbox"/> MOVIES</p> <p><input type="checkbox"/> MOVIE THEATER</p> <p><input type="checkbox"/> MUSIC</p> <p><input type="checkbox"/> BROADCAST GUIDE</p> <p><input type="checkbox"/> BUNGEE JUMP</p> <p><input type="checkbox"/> KILLING TIME</p>	

FIG. 3C

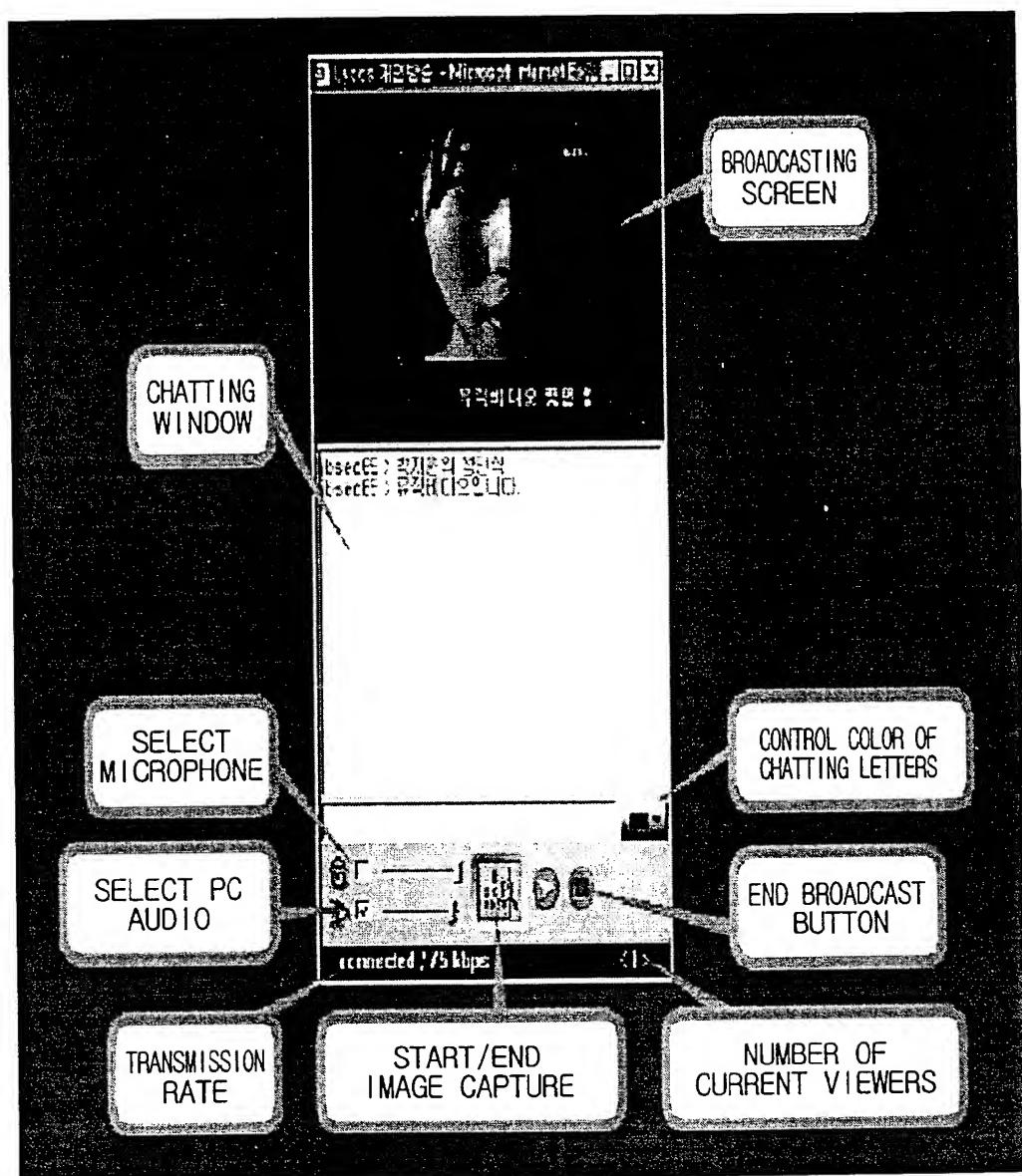


FIG. 3D

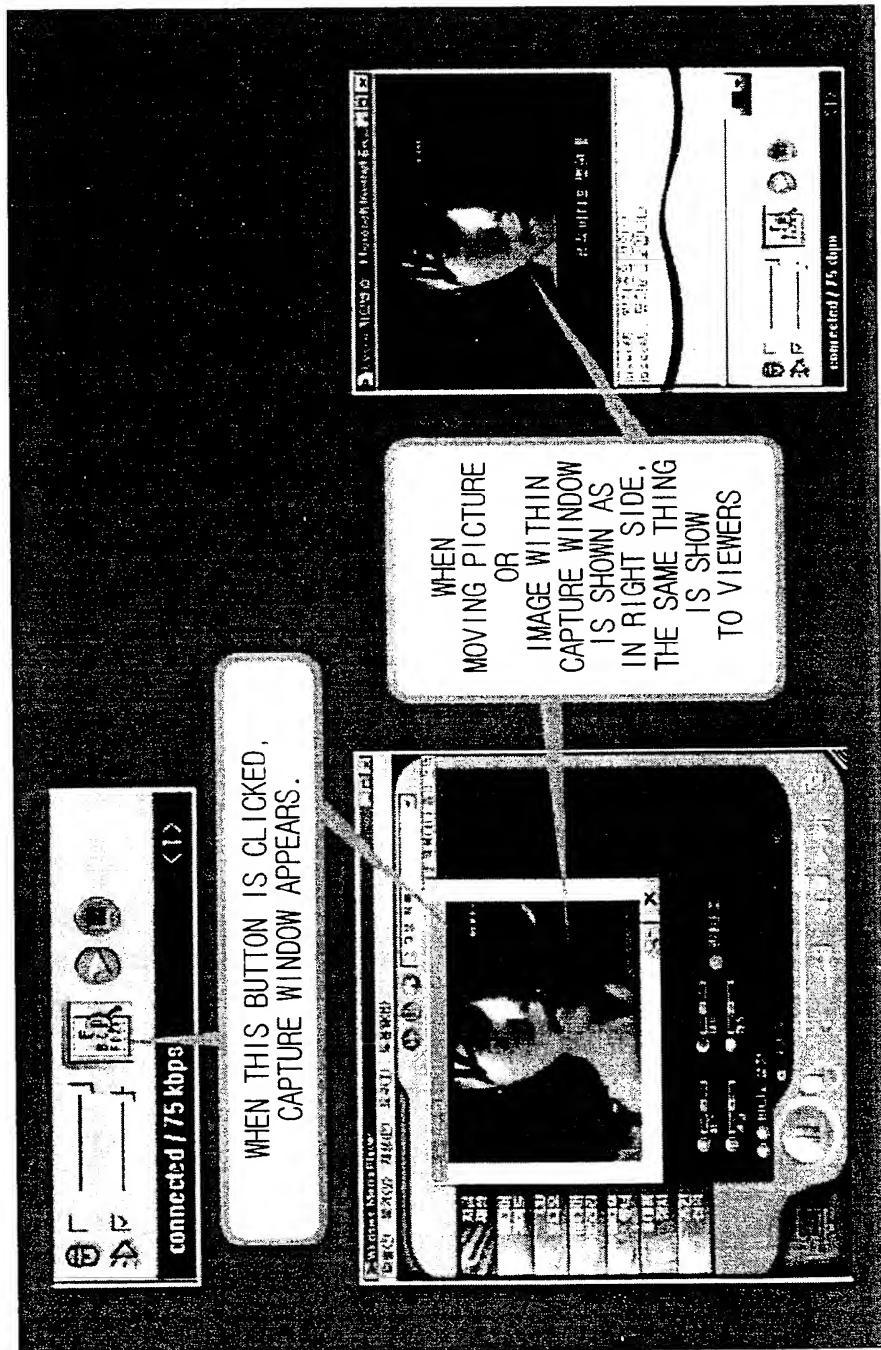


FIG. 4

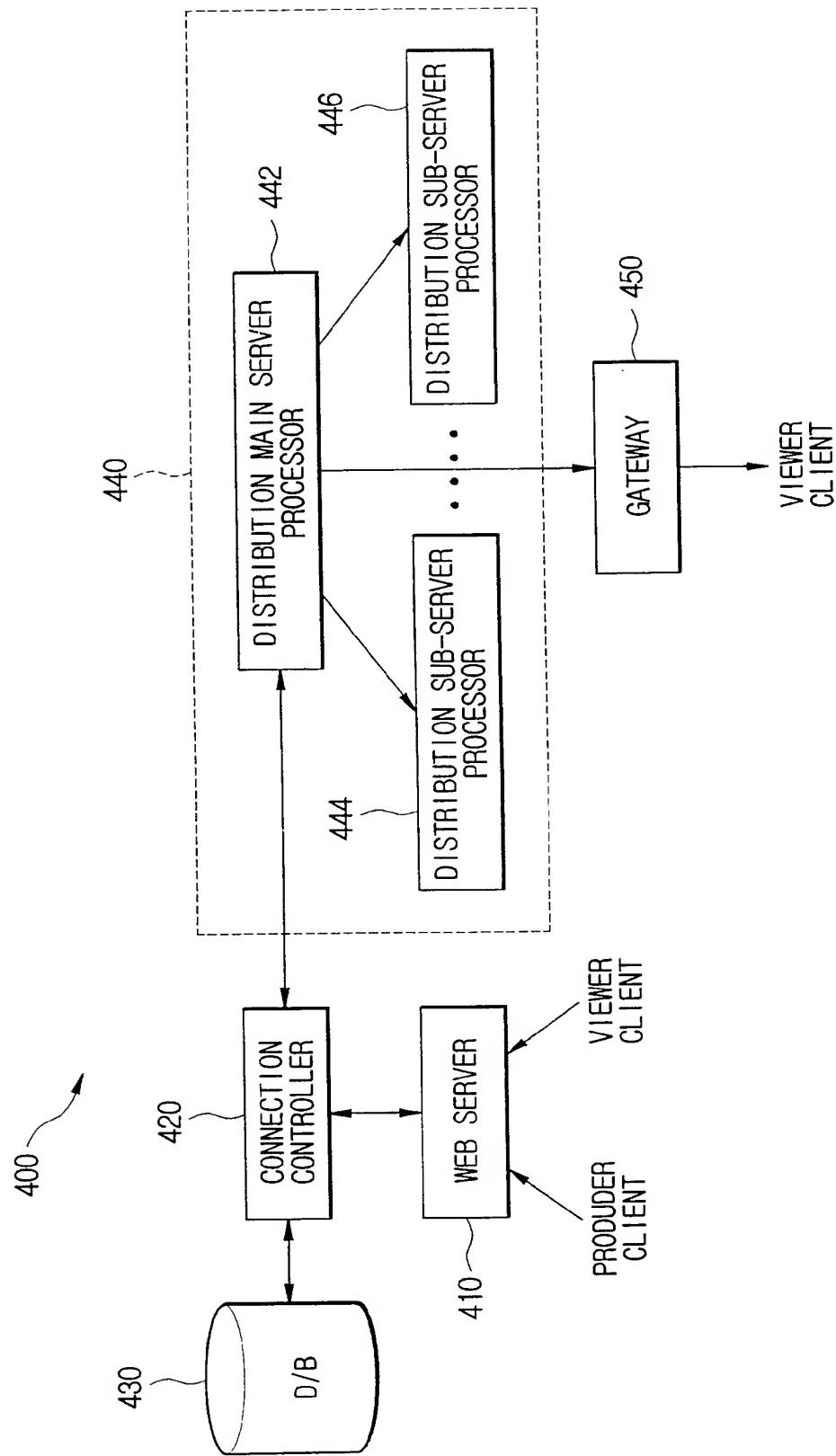


FIG. 5A

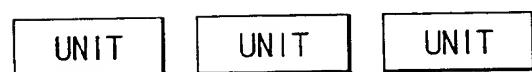
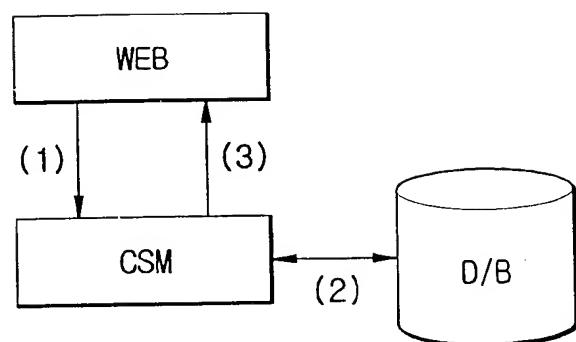


FIG. 5B

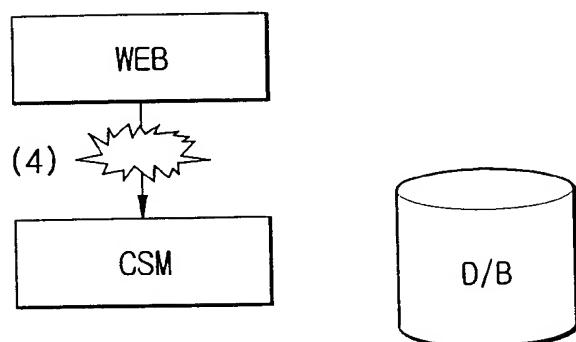


FIG. 5C

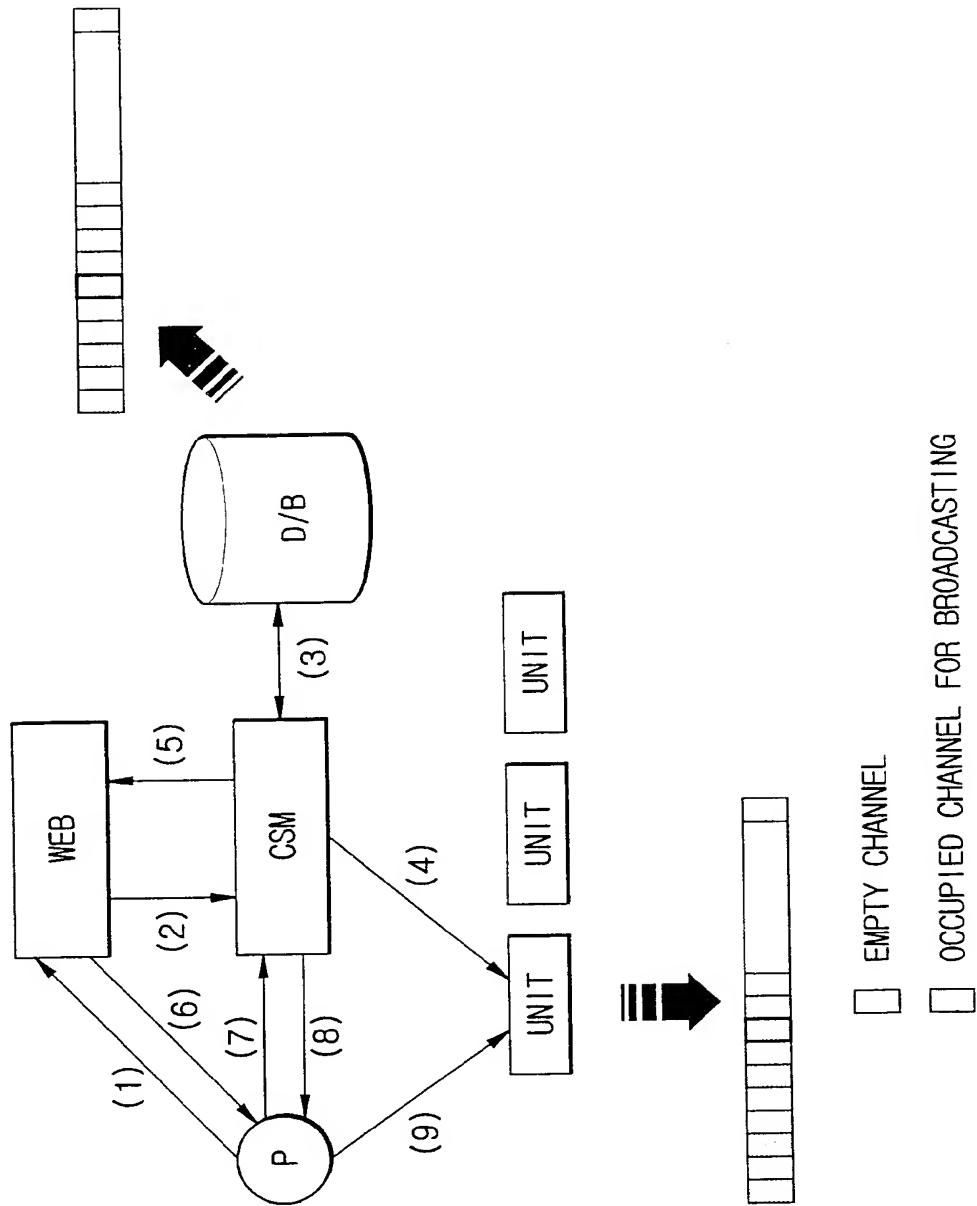


FIG. 5D

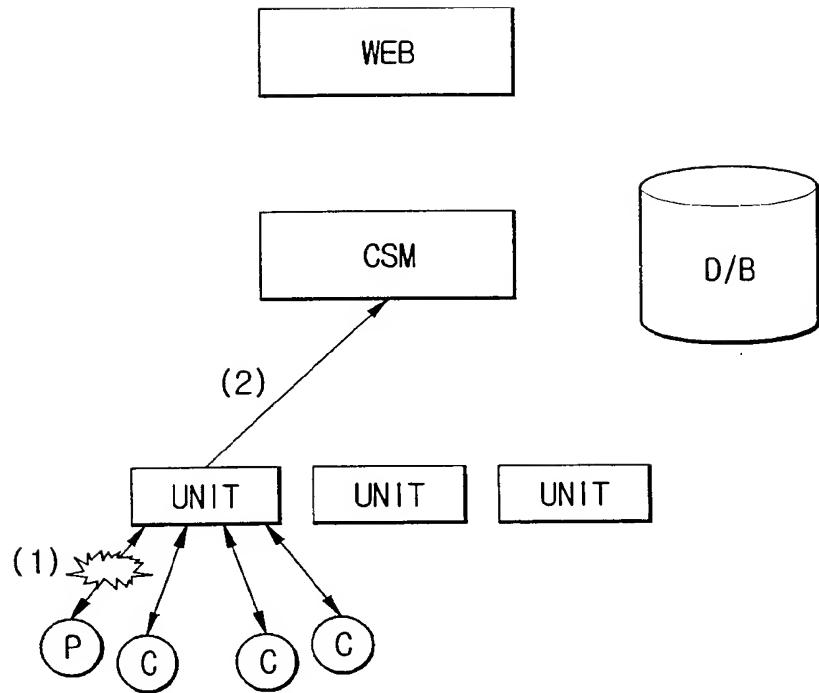


FIG. 5E

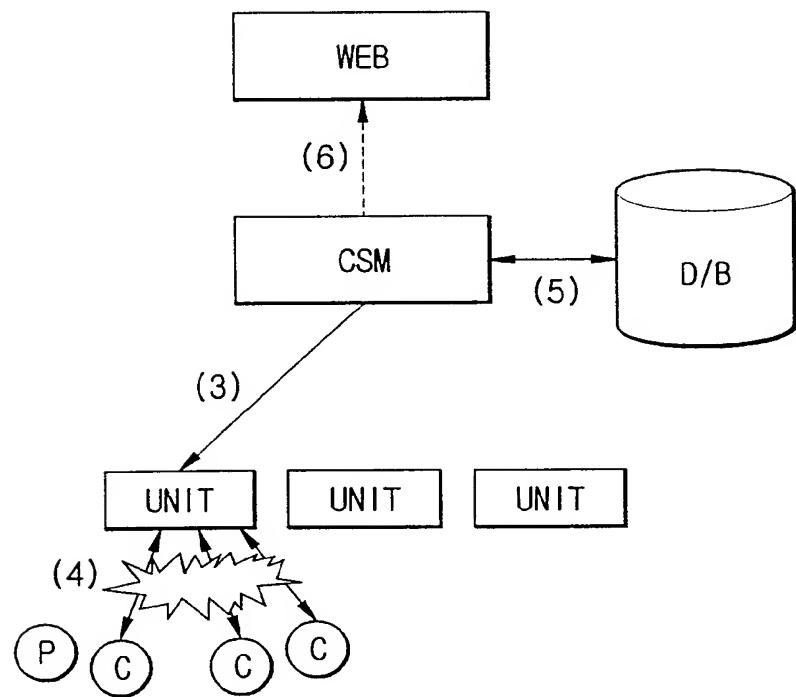


FIG. 6

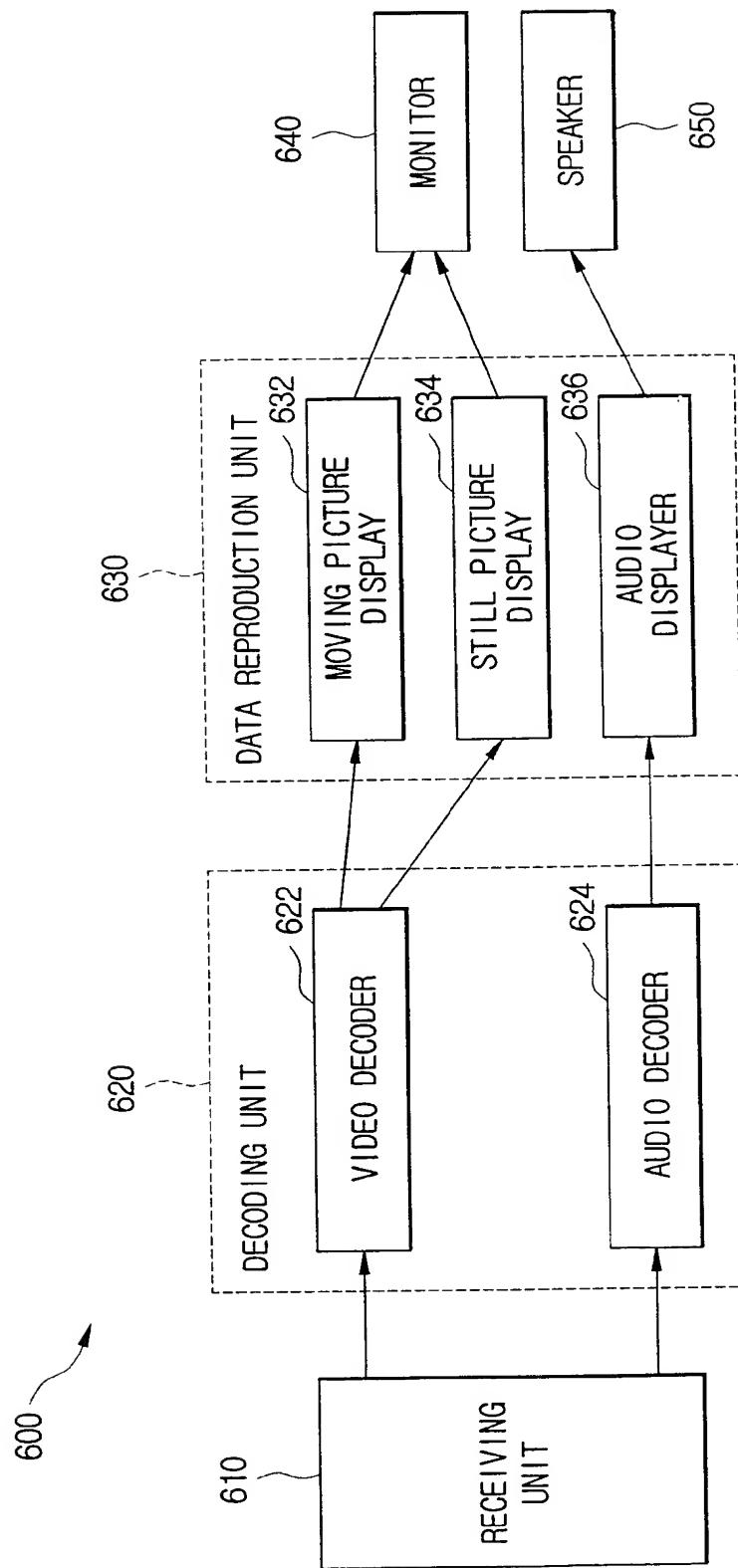


FIG. 7

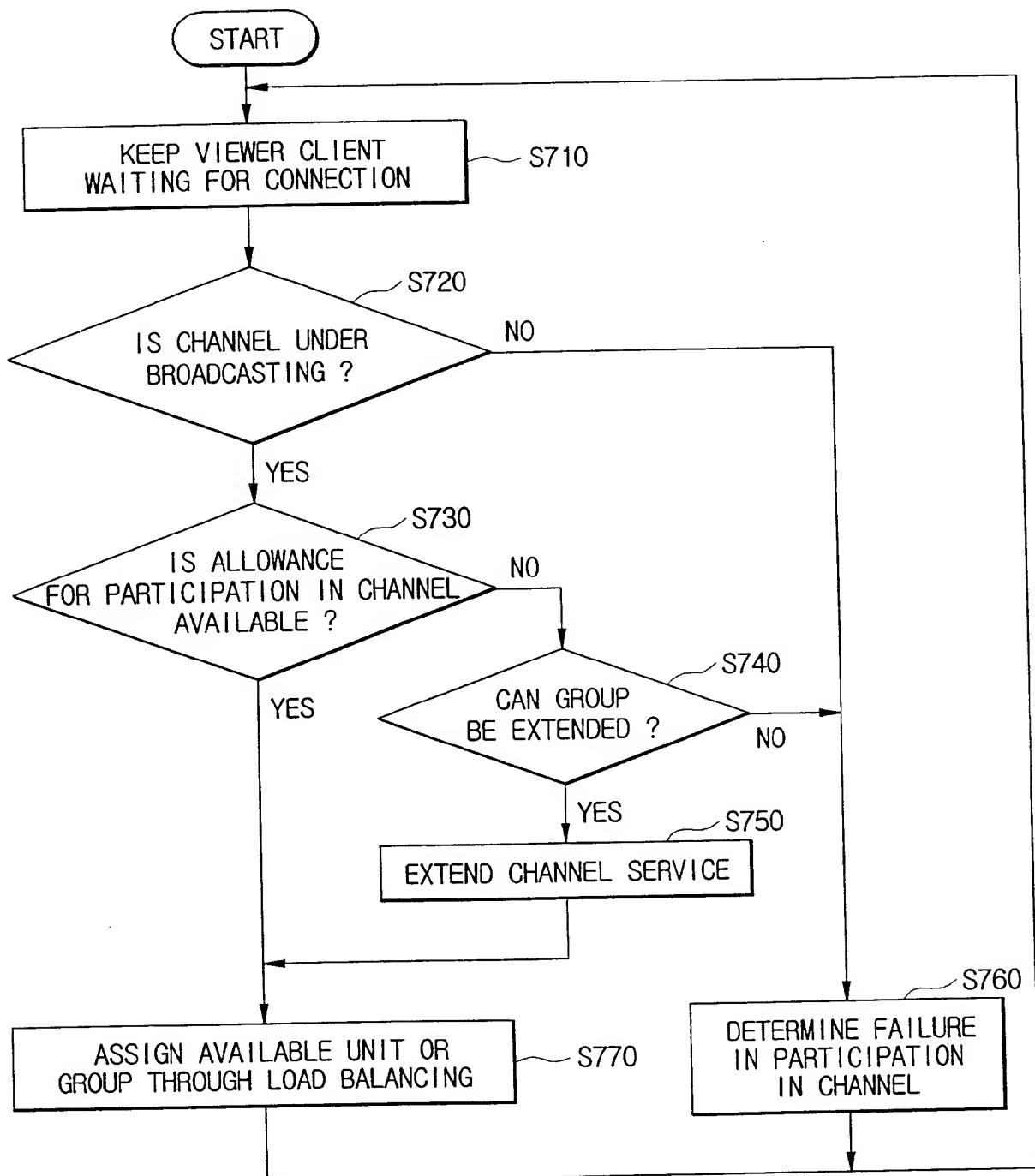
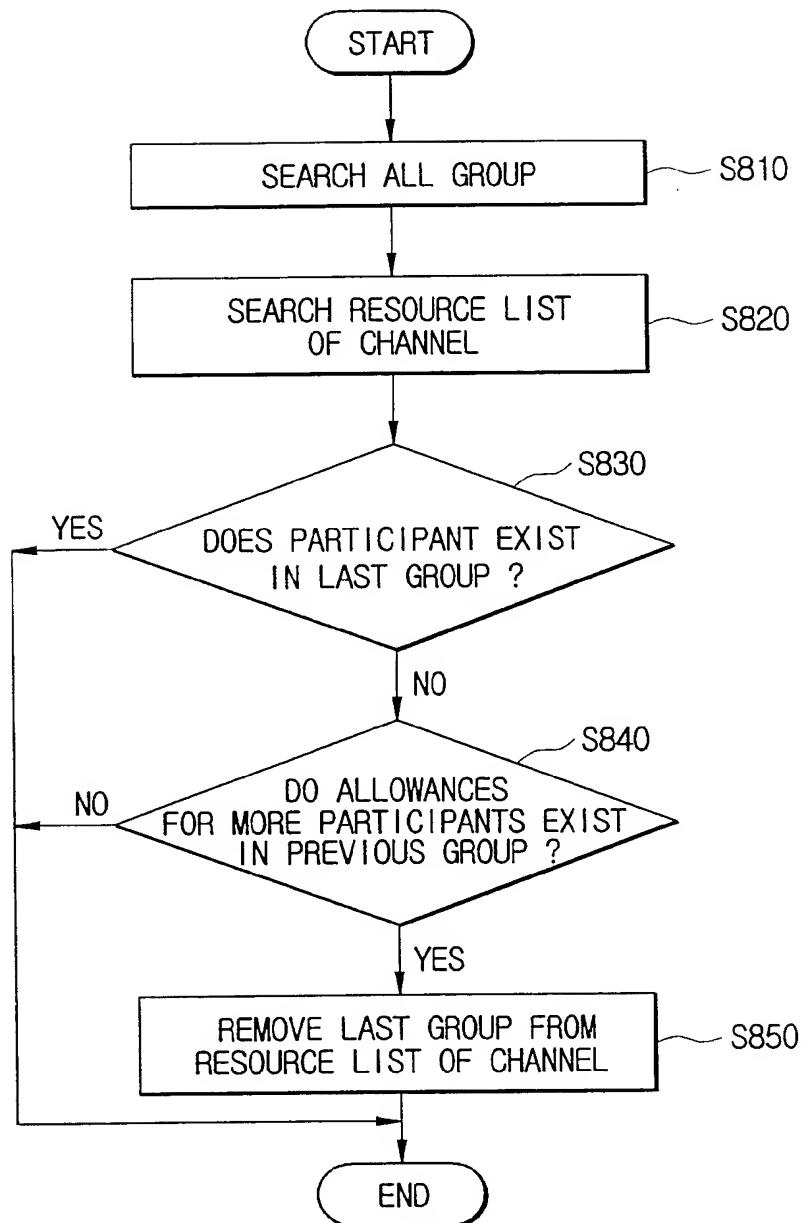


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No. PCT/KR01/00297

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G06F 17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 G06F 17/00, 17/60, 19/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 11-316761 A (NTT) NOV. 16. 1999 FIG1, ABSTRACT, CLAIM1,4	1-25
A	JP 10-257052 A (ITEN SHIJIN KOFUN YUGENKOSHI) SEP. 25. 1998 FIG2, ABSTRACT, CLAIMS1,2	1-25
A	US 5983005 A (NETCAST COMMUNICATION CORP.) NOV. 09. 1999 ABSTRACT, FIG1	1-25
A	WO 98/28698 A (NETWORK COMPUTER INC.) JULY. 02. 1998 ABSTRACT, FIG1, CLAIM1	1-25
A	WO 97/42582 A (NETCAST COMMUNICATION CORP.) NOV. 13. 1997 FIG1, ABSTRACT, CLAIM1	1-25

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

29 MAY 2001 (29.05.2001)

Date of mailing of the international search report

31 MAY 2001 (31.05.2001)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon
Metropolitan City 302-701, Republic of Korea

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